1663

LOS ALAMOS SCIENCE AND TECHNOLOGY MAGAZINE

About Our Name:
During World War II, all that the outside world knew of Los Alamos and its top-secret laboratory was the mailing address—P. O. Box 1663, Santa Fe, New Mexico. That box number, still part of our address, symbolizes our historic role in the nation's service.

About the LDRD Logo:
Laboratory Directed Research and Development (LDRD) is a competitive, internal program by which Los Alamos National Laboratory is authorized by Congress to invest in research and development that is both highly innovative and vital to our national interests. Whenever *1663* reports on research that received support from LDRD, this logo appears at the end of the article.

About the Cover:
This year marks the 70th anniversary of Los Alamos National Laboratory. Originally tasked to develop the atomic bomb, the Laboratory has since broadened its science and engineering mission to include all manners of challenges to our national security. While the cover artwork on this issue highlights some of the faces and achievements of the last 70 years and today, the feature articles focus on the future and some of the Los Alamos research projected to have a major impact in the coming decades.

Los Alamos Firsts

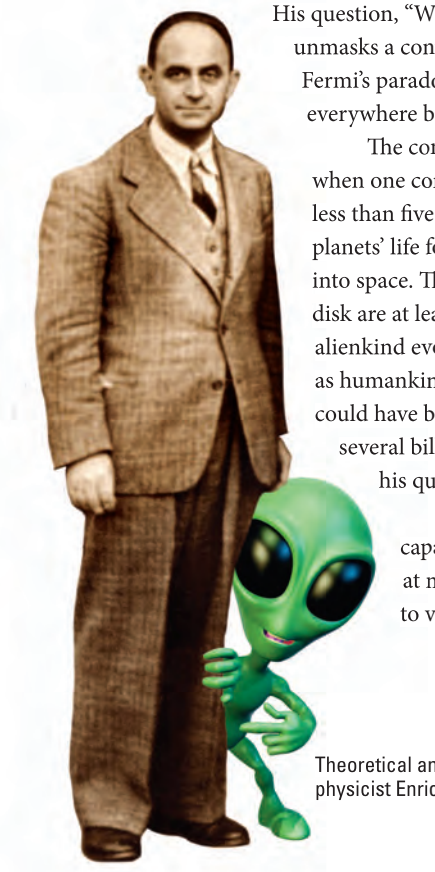
Little Green Men

As Herbert York recalled,* he and fellow physicists Edward Teller, Emil Konopinski, and Enrico Fermi were having lunch at Fuller Lodge in Los Alamos on a late summer day in 1950 when Fermi said, virtually apropos of nothing, "Don't you ever wonder where everybody is?" Konopinski remembered that Fermi surprised everyone with the question, "But where is everybody?" Teller, for his part, remembered that the four men had discussed aliens and faster-than-light space travel as they walked to lunch, so when Fermi later asked, clear out of the blue, "Where is everybody?" there was general laughter because everyone "seemed to understand at once that he was talking about extraterrestrial life."

According to York, Fermi concluded that "we ought to have been visited long ago and many times over." His question, "Where is everybody?" thus unmasks a contradiction, often referred to as Fermi's paradox, that space aliens should be everywhere but don't seem to be anywhere.

The contradiction becomes clearer when one considers that the Sun formed less than five billion years ago, and one of its planets' life forms has already sent probes into space. The oldest stars in the galactic disk are at least 8 billion years old, so if alienkind evolves at roughly the same pace as humankind, then the earliest civilizations could have begun exploring the galaxy several billion years before Fermi popped his question.

Fermi himself was quite capable of proving that it would take at most a few hundred million years to visit, colonize, or send probes to every star and habitable rock in the Milky Way, regardless of the starting point and assuming slower-than-light travel. In other words, every alien civilization that became space-worthy within the past few billion years could have visited our little planet and populated the rest of the galaxy with themselves and their technology many times over. But there's no conclusive evidence of any of this—no remnants of alien cities or advanced materials on Earth and no detections of interstellar communications or other electromagnetic broadcasts in space.



Theoretical and experimental physicist Enrico Fermi

There are many possible ways to explain this absence of evidence. Maybe aliens are content to probe other star systems from afar. Or maybe their ships, space stations, and colonies blanket the galaxy, but we lack the technology to detect them or intercept their communications—conceivably because the aliens have gone to great lengths to be inconspicuous. And maybe the timing was just off; the last alien cruise ship sailed by before the Earth was open for business. People have even postulated that all advanced societies self-destruct before they have the opportunity to spread among the stars, killed by war, disease, or other pitfalls of their own technology. Or it may simply be that the evidence for alien visitations has yet to be discovered because it's covered with jungle, frozen in ice, or hidden in plain sight, unrecognized for what it is.

While there are many reasons to explain why we wouldn't see space aliens, there's only one to explain why we would: namely, that whatever transpired to bring about intelligent life on Earth also transpired elsewhere in the galaxy, perhaps millions of times among its several hundred billion stars. By tasking us to ponder the fate of those alien races, Fermi's question compels us to ponder our own. If intelligent species abound but leave no trace, will humanity too remain in obscurity? Or if a vast, ancient, alien community is finally revealed, will humanity find a place within it? And if there are no aliens at all, then what will we do with a galaxy all to ourselves?

—Jay Schecker

*Eric M. Jones, "Where is Everybody? An Account of Fermi's Question." Los Alamos report LA_10311-MS.